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NATIONAL DAM INSPECTION PROGRAM. SUGAR CREEK DAM (NOI ID NUMBER--ETC(U)
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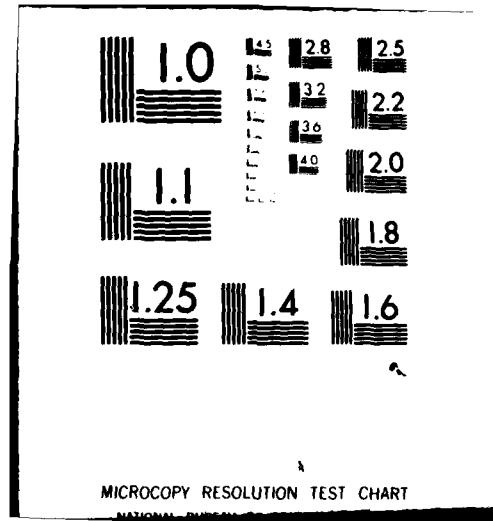
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SUSQUEHANNA RIVER BASIN
SOUTH BRANCH SUGAR CREEK, BRADFORD COUNTY

PENNSYLVANIA

6 National Dam Inspection Program

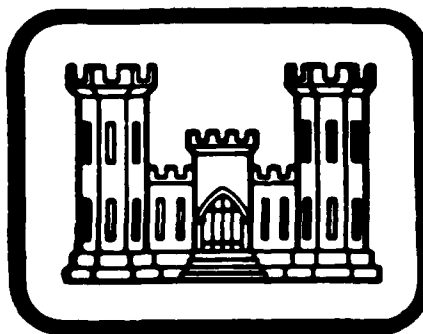
SUGAR CREEK DAM

(NDI ID NO. PA-728)

DER ID NO. 8-53

~~TENNESSEE GAS PIPELINE COMPANY~~

Susquehanna River Basin, South Branch Sugar Creek, Bradford
County, Pennsylvania
PHASE I INSPECTION REPORT.
NATIONAL DAM INSPECTION PROGRAM



R. Jeffrey

/Kim

113-44-3-4116
Prepared By

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CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG, PENNSYLVANIA
15931

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FOR
DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT CORPS OF ENGINEERS
BALTIMORE, MARYLAND
21203

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11 MAR 1981

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

Approval For		
Phase I		
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Distribution/		
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PHASE I REPORT
NATIONAL DAM INSPECTION REPORT

NAME OF DAM	Sugar Creek Dam
STATE LOCATED	Pennsylvania
COUNTY LOCATED	Bradford
STREAM	South Branch Sugar Creek
DATES OF INSPECTION	October 21, 1980 and January 15, 1981
COORDINATES	Lat: 41° 44.7' Long: 76° 47.2'

ASSESSMENT

The assessment of Sugar Creek Dam is based upon visual observations made at the time of inspection, review of available records and data, hydraulic and hydrologic computations and past operational performance. The inspection and review of Sugar Creek Dam did not reveal any problems which would require emergency action. The dam appears to be in fair condition and in need of minor maintenance.

The Sugar Creek Dam is a high hazard-small size dam. The spillway design flood (SDF) for a dam of this size and classification is 1/2 PMF to PMF. The PMF has been selected as the spillway design flood based on the downstream potential for loss of life. The spillway and reservoir are considered capable of controlling approximately 50% of the PMF. The 0.1 feet of overtopping of the embankment crest during the 1/2 PMF event for a duration of 1 hour was not considered sufficient to cause failure of the structure. Based on the judgement of the evaluating engineer, the location and duration of the overtopping as well as the existence of a concrete curb on the upstream and downstream edge of the embankment crest would sufficiently contain the overtopping to the spillway area minimizing damage to the embankment and spillway. The spillway is considered inadequate.

The following recommendations and remedial measures should be instituted as soon as possible.

1. The hole on the upstream slope adjacent to the left spillway approach wingwall and the settlement on the downstream slope adjacent to the right spillway wingwall should be repaired as soon as possible. The settlement on the downstream slope should be monitored on a regular basis. The location of the settlement is on line with the drainline and if the settlement continues the source of the settlement should be investigated.
2. An operations and maintenance program should be prepared and implemented.
3. A warning system should be developed to warn downstream residents of large spillway discharges or imminent failure of the dam.
4. A safety inspection program should be implemented with inspections at regular intervals by qualified personnel.

SUGAR CREEK DAM
PA 728

5. A positive upstream closure should be developed for the reservoir drain and the valve should be operated on a regular basis.

6. Drainage from the roadway should be diverted away from the toe of the dam.

7. The concrete on the spillway approach wingwalls and discharge channel walls should be repaired.

8. The vegetation which exists along the waterline of the upstream slope should be removed to insure that the spillway approach does not become blocked by vegetation.

SUBMITTED BY:

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS AND ARCHITECTS

FEB. 25, 1981

Date

R Jeffrey Kimball

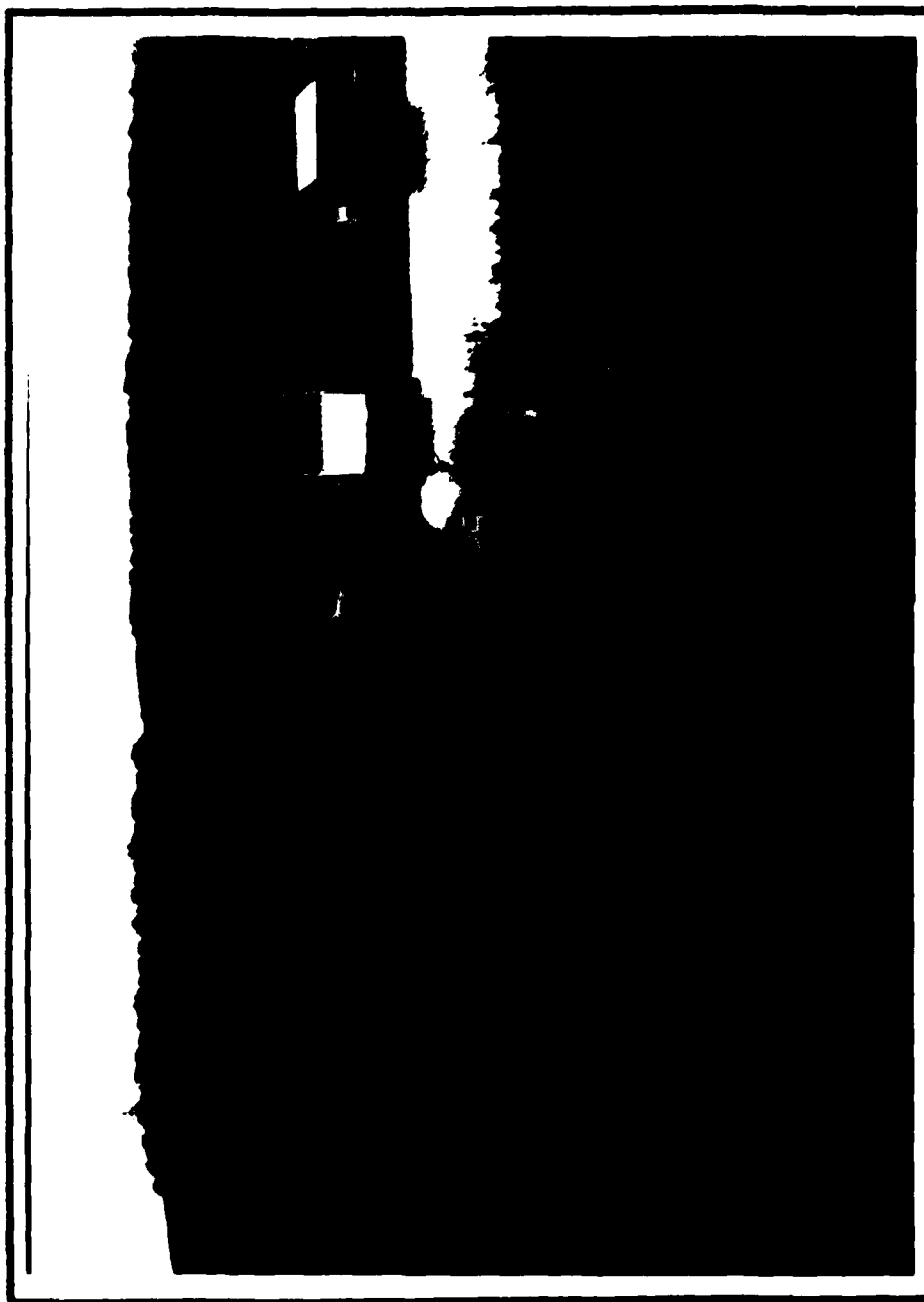
R. Jeffrey Kimball, P.E.

APPROVED BY:

27 MAR 81

Date

James W. Peck
JAMES W. PECK
COL., Corps of Engineers
District Engineer



Overview of Sugar Creek Dam.

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PHASE I
NATIONAL DAM INSPECTION PROGRAM

SUGAR CREEK DAM
NDI. I.D. NO. PA 728
DER I.D. NO. 8-53

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Sugar Creek Dam is an earthfill dam with a concrete corewall, 250 feet long and 15 feet high. The crest width of the dam is 13 feet. The upstream and downstream slopes are 2H:1V and grass covered. The crest of the dam serves as a gravel roadway with concrete curbs.

The spillway is located at the center of the earthen embankment section and consists of a concrete lined semi-ogee shaped spillway. The discharge end of the spillway is equipped with 27 water baffles. A small steel deck bridge spans the spillway crest. One concrete pier in the centerline of the spillway supports the bridge. The effective weir length of the spillway is 40 feet.

A small pumping station is located on the right bank of the reservoir and is utilized to pump cooling fluid to the compressor station to cool the pumps at the station.

b. Location. The dam is located approximately 2.5 miles south of the Borough of Troy, Bradford County, Pennsylvania. The Sugar Creek Dam can be located on the Canton, U.S.G.S. 7.5 minute quadrangle.

c. Size Classification. The Sugar Creek Dam is a small size dam (15 feet high, 147 acre-feet).

d. Hazard Classification. The Sugar Creek Dam is a high hazard dam. Downstream conditions indicate that the loss of more than a few lives is probable should the structure fail. One home is located approximately 1/2 mile downstream of the dam.

e. Ownership. The Sugar Creek Dam is owned by The Tennessee Gas Pipeline Company. Correspondence should be addressed to:

The Tennessee Gas Pipeline Company
485 Sunset Drive
Hamburg, NY 14075
Attention: Mr. R.C. Hines
716/648-0760

f. Purpose of Dam. The Sugar Creek Dam is used to provide cooling water for the Tennessee Gas Pipeline Company Compressor Station.

g. Design and Construction History. The construction of the Sugar Creek Dam was completed in November, 1956. The structure was designed by the Tennessee Gas and Pipeline Company and construction was completed by S. E. Williams of Canton, Pennsylvania.

h. Normal Operating Procedures. Remote control operations allow water to be drawn from the reservoir to provide cooling water for the compressor stations transmission pumps on an as-need basis. Two pumps are housed in the pumping station located on the right edge of the reservoir. Normal operations require only one pump be utilized during the cooling process. The second pump is utilized as a backup unit. The two 6" pumps are supplied by a 24" steel pipe with a slotted intake riser.

1.3 Pertinent Data.

a. Drainage Area. 1.1 square miles

b. Discharge at Dam Site (cfs).

Maximum known flood at dam site	Unknown
Drainline capacity at normal pool	Unknown
Spillway capacity at top of dam	1660

c. Elevation (U.S.G.S. Datum) (feet). - Field survey based on a spillway crest elevation 1354.8 feet obtained from design drawings.

Top of dam - low point	1359.9
Top of dam - design height	1359.7
Maximum pool - design surcharge	1359.7
Normal pool	1354.8
Drainline entrance invert	1344.9
Drainline exit invert	1344.9
Toe of dam	1344.9
Tailwater	None

d. Reservoir (feet).

Length of maximum pool (PMF)	3000
Length of normal pool	1500

e. Storage (acre-feet).

Normal pool	23
Top of dam	147

f. Reservoir Surface (acres).

Top of dam	41
Normal pool	7
Spillway crest	7

g. Dam.

Type	Earthfill
Length (including spillway)	250 feet
Height	15 feet
Top width	13 feet
Side slopes - upstream	2H:1V
- downstream	2H:1V
Zoning	None
Impervious core	Concrete corewall
Cutoff	Yes
Grout curtain	None

h. Reservoir Drain.

Type	12" CIP
Length	81 feet
Closure	12" gate valve
Access	30" diameter riser pipe
	on downstream slope
Regulating facilities	12" gate valve

i. Spillway.

Type	Concrete lined ogee
Length (effective)	40 feet
Crest elevation	1354.8
Upstream channel	Lake
Downstream channel	Natural streambed

SECTION 2
ENGINEERING DATA

2.1 Design. Review of information in the files of the Commonwealth of Pennsylvania, Department of Environmental Resources revealed that some correspondence, design drawings, photographs and permit information were available for review. Mr. Dick Blaze, site superintendent, accompanied the inspection team during the October 21, 1980, inspection of the dam. Mr. Blaze did not provide any additional information.

2.2 Construction. Construction of the Sugar Creek Dam was completed during November, 1956. No other information is available on the construction of the dam. S.E. Williams, a Canton contractor completed the construction of the dam.

2.3 Operation. The only operation conducted at the dam is to pump water from the reservoir to the transmission station to cool the transmission pumps. No other operations are conducted at the dam.

2.4 Evaluation.

a. Availability. Engineering data were provided by PennDER, Bureau of Dams and Waterway Management. The owner of the dam is the Tennessee Gas Pipeline Company. A representative of that organization accompanied the inspection team during the October 21, 1980 inspection of the dam and was interviewed in regards to the operation and maintenance of the dam.

b. Adequacy. The Phase I report was based on visual inspection and hydrologic and hydraulic analysis. Sufficient information exists to complete a Phase I Report.

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. The onsite inspection of Sugar Creek Dam was conducted by personnel of L. Robert Kimball and Associates on October 21, 1980 and January 15, 1981. The inspection consisted of:

1. Visual inspection of the retaining structure, abutments and toe.
2. Examination of the spillway facilities, exposed portion of any outlet works and other appurtenant works.
3. Observations affecting the runoff potential of the drainage basin.
4. Evaluation of the downstream area hazard potential.

b. Dam. The dam appears to be in fair condition. From a brief survey conducted during the inspection, it was noted that the low spot on the embankment crest exists at either end of the roadway bridge which spans the spillway crest. The upstream and downstream slopes from the dam are grass covered. A bituminous roadway surface exists on the bridge and a gravel roadway exists along the crest of the dam. The upstream and downstream slopes of the dam are 2H:1V.

A 1.5 foot high concrete curb extends above the embankment crest for a distance of 172 feet. The curb is 6" in width and appeared to be in good condition.

A small hole was observed on the upstream slope of the dam adjacent to the left spillway wingwall. A small settlement area was observed on the downstream slope adjacent to the right spillway wingwall near the crest of the dam. Water foliage existed along the upstream toe of the dam and was beginning to overtake the spillway crest approach channel.

c. Appurtenant Structures. The concrete lining of the spillway channel showed some signs of deterioration. Deterioration of the concrete wingwalls and spillway discharge channel were observed during the inspection. One complete row of the water baffles, located at the discharge end of the spillway were completely deteriorated.

d. Reservoir Area. The majority of the watershed area consists of open fields. The reservoir slopes are gentle and do not appear to be susceptible to massive landslides which would affect the storage volume of the reservoir or cause overtopping of the dam by displacing water.

e. Downstream channel. The downstream channel of the dam consists of the South Branch of Sugar Creek. The South Branch of Sugar Creek joins Sugar Creek approximately 2.5 miles downstream of the Borough of Troy. One home (4 people) 1/2 mile downstream of dam.

3.2 Evaluation. The embankment appeared to be in fair condition. A small hole was observed on the upstream slope of the dam adjacent to the left spillway wingwall and a small settlement area was observed on the downstream slope adjacent to the right spillway wingwall. No signs of erosion or seepage were observed during the inspection.

SECTION 4 OPERATIONAL PROCEDURES

4.1 Procedures. Normally, the waterlevel in the reservoir is maintained at the spillway crest elevation, 1354.8. Water is drawn from the reservoir on an as-needed basis to provide cooling water for the transmission compressor station.

4.2 Maintenance of the Dam. No planned maintenance schedule exists for the Sugar Creek Dam. Maintenance of the dam is completed on an unscheduled, as-needed basis.

4.3 Maintenance of Operating Facilities. No planned maintenance program exists for the operating facilities at the dam. Maintenance of the pumping station located on the right edge of the reservoir area is completed on an unscheduled, as-needed basis.

4.4 Warning System in Effect. No emergency warning system exists at the Sugar Creek Dam.

4.5 Evaluation. The condition of the dam is considered fair. There was no warning system in effect to warn downstream residents. An emergency action plan should be available for every dam in the high and significant category. Such plans should outline actions taken by the operator to minimize downstream effects of an emergency and should include an effective warning system. An emergency action plan has not been developed and the owner should develop such an action plan.

The hole on the upstream slope and the settlement on the downstream slope should be repaired. The settlement area should be monitored on a regular basis and if the settlement continues, the cause of the settlement should be investigated.

SECTION 5 HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features.

a. Design Data. The DER files did not contain any hydraulic or hydrologic design calculations used in the design of these facilities. Some elevation-storage information was obtained from the design drawings (See Appendix E-2). The drawings contained in the PennDER files were reviewed for the purpose of this report.

b. Experience Data. No rainfall, runoff or reservoir level data were available. The spillway reportedly has functioned adequately in the past.

c. Visual Observations. The spillway appeared to be in fair condition. The low point on the embankment crest exists at the edges of the roadway bridge which spans the spillway crest. It was observed that the earthen embankment crest sloped gently to the left and right abutment. A 1.5 foot high concrete curb exists along the upstream and downstream edge of the embankment crest.

d. Overtopping Potential. Overtopping potential was investigated through the development of the probable maximum flood (PMF) for the watershed and the subsequent routing of the PMF and fractions of the PMF through the reservoir and spillway.

The Corps of Engineers, Baltimore District, has directed that the HEC-1 Dam Safety Version systemized computer program be utilized. The program was prepared by the Hydrologic Engineering Center (HEC), U.S. Army Corps of Engineers, Davis, California, July, 1978. The major methodologies or key input data for this program are discussed briefly in Appendix D.

5.2 Evaluation Assumptions. To enable us to complete the hydraulic and hydrologic analysis for this structure, it was necessary to make the following assumptions.

1. Pool elevation prior to the storm was at the spillway crest elevation, 1354.8 feet.

2. The potential to pump water from the reservoir was not considered during the analysis.

3. The top of dam was considered to be the low spot elevation located at either end of the bridge which spans the spillway crest. The top of dam elevation was considered to be 1359.9 feet.

4. The 1.5 foot high concrete curb which exists along the upstream and downstream edge of the crest was not considered in the analysis.

5.3 Summary of Overtopping Analysis. Complete summary sheets for the computer output are presented in Appendix D.

Peak inflow (PMF)	3700 cfs
Spillway capacity	1659 cfs

a. **Spillway Adequacy Rating.** The Spillway Design Flood (SDF) for a dam of this size and classification is in the range of 1/2 PMF to the PMF. The Spillway Design Flood for this dam was selected to be the PMF based on the downstream potential for loss of life. Based on the following definition provided by the Corps of Engineers, the spillway is rated as inadequate as a result of our hydrologic analysis.

Inadequate - All high hazard dams which do not pass the spillway design flood (PMF).

The spillway and reservoir are considered capable of controlling approximately 50% of the PMF without overtopping the embankment.

5.4 Summary of Dam Breach Analysis. Although the subject dam is only marginally capable of passing 50% of the PMF, it was the judgement of the evaluating engineer that the 0.1 foot of overtopping of the dam for a period of 1 hour was not sufficient to cause failure of the structure. This judgement was based on the location of the low spot on the top of dam and the existence of the 1.5 foot concrete curb on the upstream and downstream edge of the spillway crest. The location of the overtopping and the existence of the curb would tend to confine the overtopping to the spillway area. Therefore, based on the judgement of the evaluating engineer, it was not necessary to perform the dam breach analysis and the downstream routing of the flood wave.

SECTION 6 STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. No erosion was observed on the embankment crest or slopes at the time of inspections. No seepage was observed during the inspections. The waterlevel (elevation 1353.8) was approximately one foot below normal pool during the inspection. No structural deficiencies were observed during the time of the inspection and the embankment appeared to be in fair condition. A small hole was observed on the upstream slope adjacent to the left spillway wingwall and a small settlement area was observed on the downstream slope adjacent to the right spillway wingwall. Both the hole on the upstream slope and the settlement on the downstream slope were near the embankment crest. The hole and settlement did not appear to be major problems affecting the stability of the structure.

b. Design and Construction Data. Sufficient data was available for review in the DER files. No construction information was available. It was reported by the site superintendent, Mr. Dick Blaze, that the construction of the dam was completed by a Canton contractor. Review of the design information supplied by the Pennsylvania Department of Environmental Resources, were reviewed for the purposes of this report.

c. Operating Records. No operating records exist at the dam.

d. Post Construction Changes. No post construction changes are known to have occurred since the structure was completed in 1964.

e. Seismic Stability. The dam is located in seismic zone 1. No seismic stability analysis has been performed. Normally, it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake loading. Since no signs of instability were noted during the inspection, the Sugar Creek Dam is assumed to be safe for earthquake loading.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The dam appeared to be in fair condition. A hole on the upstream slope of the dam near the embankment crest and the settlement on the downstream slope adjacent to the right spillway wingwall appeared to require only routine maintenance to correct the situation. No erosion or seepage were observed during the inspections. The visual observations, review of available data, hydrologic and hydraulic calculations and past operational performance indicate that the Sugar Creek Dam is considered capable of controlling approximately 50% of the PMF. The 0.1 foot of overtopping during the 1/2 PMF event for a duration of 1 hour was not considered sufficient to cause failure of the structure due to the location of overtopping and the existence of a concrete curb along the upstream and downstream edge of the embankment crest. The spillway is considered inadequate.

b. Adequacy of Information. Sufficient information is available to complete a Phase I Report.

c. Urgency. The recommendations suggested below are of a minor nature and should be implemented as soon as possible.

d. Necessity for Further Investigation. No further investigations are required.

7.2 Recommendations/Remedial Measures.

1. The hole on the upstream slope adjacent to the left spillway approach wingwall and the settlement on the downstream slope adjacent to the right spillway wingwall should be repaired as soon as possible. The settlement on the downstream slope should be monitored on a regular basis. The location of the settlement is on line with the drainline and if the settlement continues the source of the settlement should be investigated.

2. A regular maintenance program should be prepared and implemented.

3. A warning system should be developed to warn downstream residents of large spillway discharges or imminent failure of the dam.

4. A safety inspection program should be implemented with inspections at regular intervals by qualified personnel.

5. A positive upstream closure should be developed for the reservoir drain and the valve should be operated on a regular basis.

6. Drainage from the roadway should be diverted away from the toe of the dam.

7. The concrete on the spillway approach wingwalls and discharge channel walls should be repaired.

8. The vegetation which exists along the waterline of the upstream slope should be removed to insure that the spillway approach does not become blocked by vegetation.

APPENDIX A
CHECKLIST, VISUAL INSPECTION, PHASE I

CHECK LIST
VISUAL INSPECTION
PHASE I

NAME OF DAM Sugar Creek Dam COUNTY Bradford STATE Pennsylvania ID# PA 728
TYPE OF DAM Earthfill
DATE(s) INSPECTION October 21, 1980 HAZARD CATEGORY High
January 15, 1981 WEATHER Seasonal TEMPERATURE Seasonal

POOL ELEVATION AT TIME OF INSPECTION 1353.8 M.S.L. TAILWATER AT TIME OF INSPECTION None M.S.L.

INSPECTION PERSONNEL:

- R. Jeffrey Kimball, P.E. - L. Robert Kimball and Associates
- James T. Hockensmith - L. Robert Kimball and Associates
- O.T. McConnell - L. Robert Kimball and Associates
- Mr. Dick Blaze - Tennessee Gas Pipeline Company

O.T. McConnell
RECORDER

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	Small hole observed on upstream slope adjacent to the left spillway wingwall near the crest of the dam.	The hole should be repaired.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	A small settlement area was observed on the downstream slope present to the right spillway wingwall.	The settlement should be observed and if it continues, the cause of the settlement should be investigated.
SLOUCHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Appeared adequate.	
RIPRAP FAILURES	Not applicable.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VEGETATION	Upstream and downstream slope grass covered.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	A small hole was observed on the upstream slope adjacent to the left spillway wingwall. A small settlement area was observed adjacent to the right discharge channel wall.	The hole and settlement area should be repaired.
ANY NOTICEABLE SEEPAGE	None.	
STAFF GAUGE AND RECORDER	None.	
DRAINS	None.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	Not applicable.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Not applicable.	
DRAINS	Not applicable.	
WATER PASSAGES	Not applicable.	
FOUNDATION	Not applicable.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Not applicable.	
STRUCTURAL CRACKING	Not applicable.	
VERTICAL AND HORIZONTAL ALIGNMENT	Not applicable.	
MONOLITH JOINTS	Not applicable.	
CONSTRUCTION JOINTS	Not applicable.	
STAFF GAUGE OR RECORDER	Not applicable.	

OUTLET WORKS (Reservoir Drain)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Not applicable.	
INTAKE STRUCTURE	Not observed during inspection.	
OUTLET STRUCTURE	12" CIP at downstream toe.	
OUTLET CHANNEL	Unrestricted.	
EMERGENCY GATE	12" gate valve.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Broad crest with a semi-ogee shape discharge.	
APPROACH CHANNEL	Unrestricted lake.	
DISCHARGE CHANNEL	Natural stream.	
BRIDGE AND PIERS	A bridge spans the spillway crest with 5 piers parallel to the direction of flow through the spillway.	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Not applicable.	
APPROACH CHANNEL	Not applicable.	
DISCHARGE CHANNEL	Not applicable.	
BRIDGE AND PIERS	Not applicable.	
GATES AND OPERATION EQUIPMENT	Not applicable.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	A narrow channel exists for a distance of approximately 2.5 miles at which point the south branch of Sugar Creek joins Sugar Creek at the Borough of Troy.	
SLOPES	Appear to be stable.	
APPROXIMATE NO. OF HOMES AND POPULATION	One home - 4 people within 1/2 mile of the dam.	

RESERVOIR

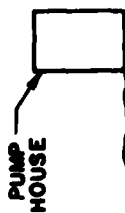
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Gentle to moderate slopes appear to be stable.	
SEDIMENTATION	Unknown.	

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None.	
OBSERVATION WELLS	None.	
WEIRS	None.	
PIEZOMETERS	None.	
OTHER	None.	



POOL
ELEV. 1353.8



PUMP
HOUSE

HEAVY VEGETATION

HEAVY VEGETATION

SPILLWAY
APPROACH

SETTLEMENT

CHOLE

+1360.6

+1360.1

+1359.9

+1359.9

+1359.9

+1361.0

+1363.2+

1362.0

1361.3

1360.8

1362.4

1364.6

CRACK

VALVE CONTROL
ACCESS

SPALLING

CONCRETE
DETERIORATION

+1345.1

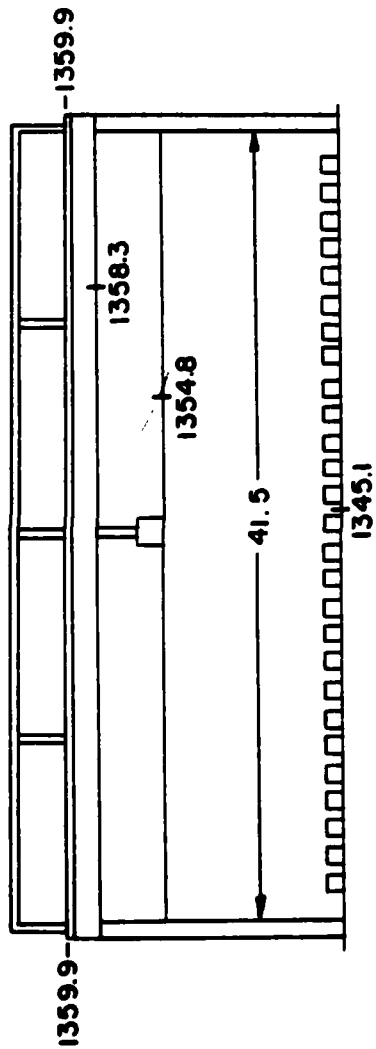
APRON

INVERT 12" C.I.P. +
1344.9

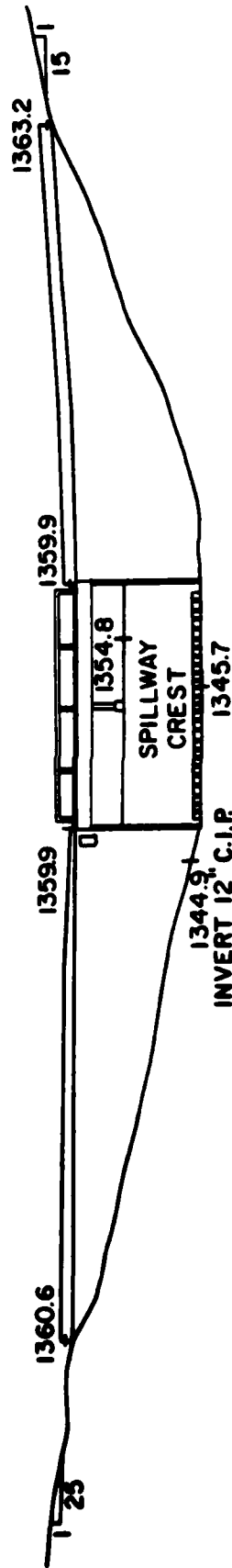


SUGAR CREEK DAM
SCALE: 1" = 30'

A-12



SPILLWAY PROFILE
LOOKING UPSTREAM
(SCALE: 1"=10')



PROFILE
LOOKING UPSTREAM
HORIZ. 1"=30'
SCALE: VERT. 1"=20'



SUGAR CREEK DAM

APPENDIX B
CHECKLIST, ENGINEERING DATA, DESIGN, CONSTRUCTION, OPERATION, PHASE I

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Sugar Creek Dam
ID# PA 728

ITEM	REMARKS
AS-BUILT DRAWINGS	In DER files. Several drawings in Appendix E.
REGIONAL VICINITY MAP	U.S.G.S. quadrangle.
CONSTRUCTION HISTORY	Owner interviewed.
TYPICAL SECTIONS OF DAM	See Appendix E, E-3.
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS RAINFALL/RESERVOIR RECORDS	See Appendix E. See Appendix E. None. None. None.

ITEM	REMARKS
DESIGN REPORTS	None available for review.
GEOLOGY REPORTS	Unknown.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Unknown.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Unknown.
POST-CONSTRUCTION SURVEYS OF DAM	None known to have occurred.
BORROW SOURCES	Unknown.

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	Unknown.
HIGH POOL RECORDS	None.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None.
MAINTENANCE OPERATION RECORDS	None.

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	See Appendix E.
OPERATING EQUIPMENT PLANS & DETAILS	See Appendix E.

APPENDIX C
PHOTOGRAPHS



P-1



P-2



P-3

P-4

P-5

SUGAR CREEK DAM
PHOTO INDEX

P - INDICATES PHOTO LOCATION



C-1

SUGAR CREEK DAM
PA 728

Sheet 1

Front

- (1) View of upstream slope and the spillway approach. Note the weeds at the toe of the upstream slope and the slotted pipe which serves as the intake for the pumping station water supply. View towards the left abutment.
- (2) Closeup of the spillway approach. Note the deteriorated concrete approach wingwalls and the bridge which spans the spillway crest.
- (3) View of the spillway crest and partial view of the downstream slope. Note the large diameter steel casing adjacent to the right spillway wingwall which houses the drainline control valve.
- (4) View of spillway discharge outlet. Note the deterioration of the concrete energy dissipators. View towards the right abutment.

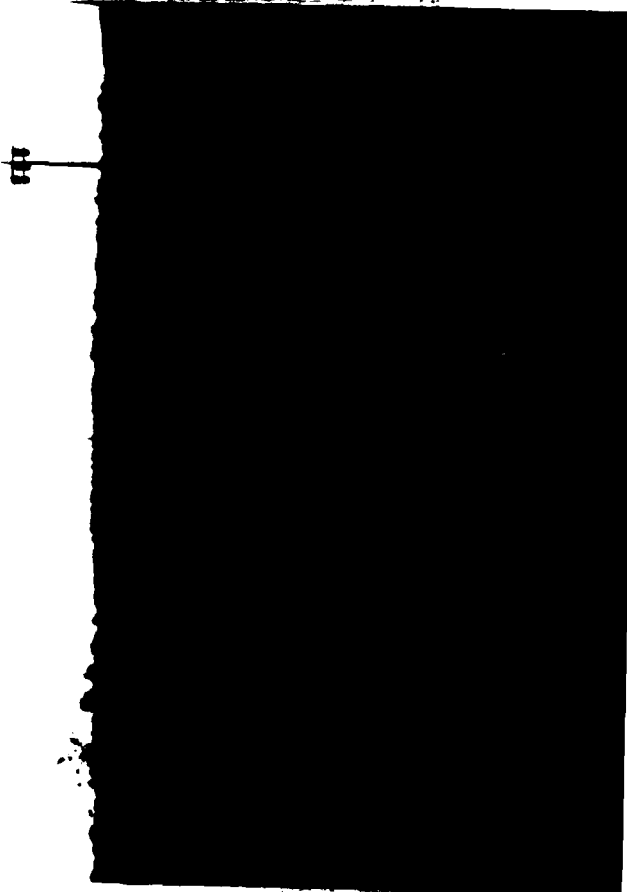
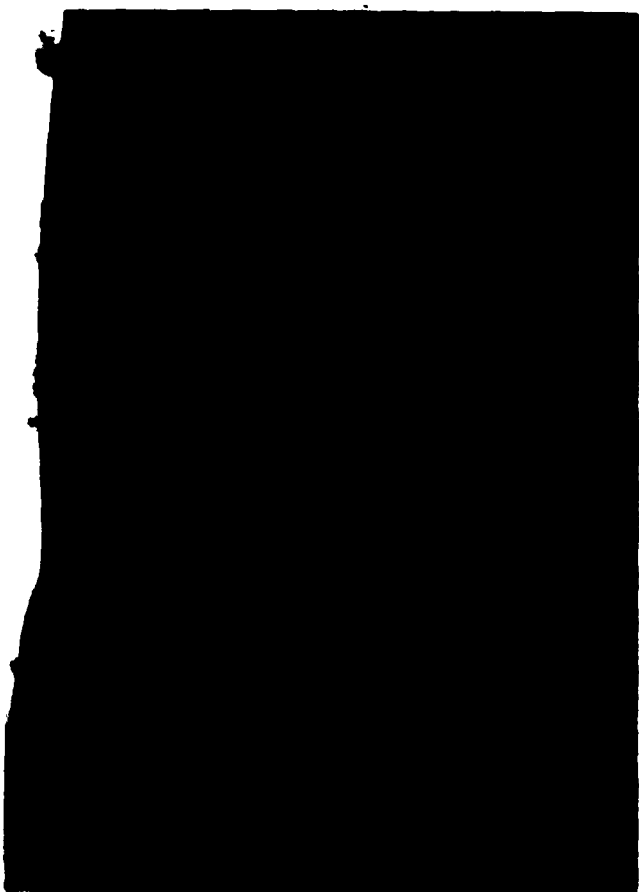
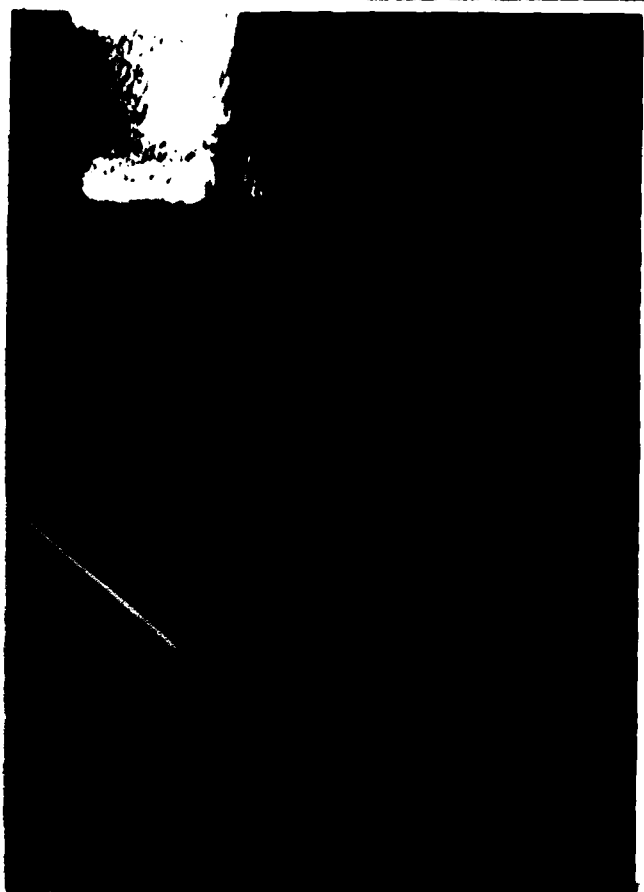
Sheet 1

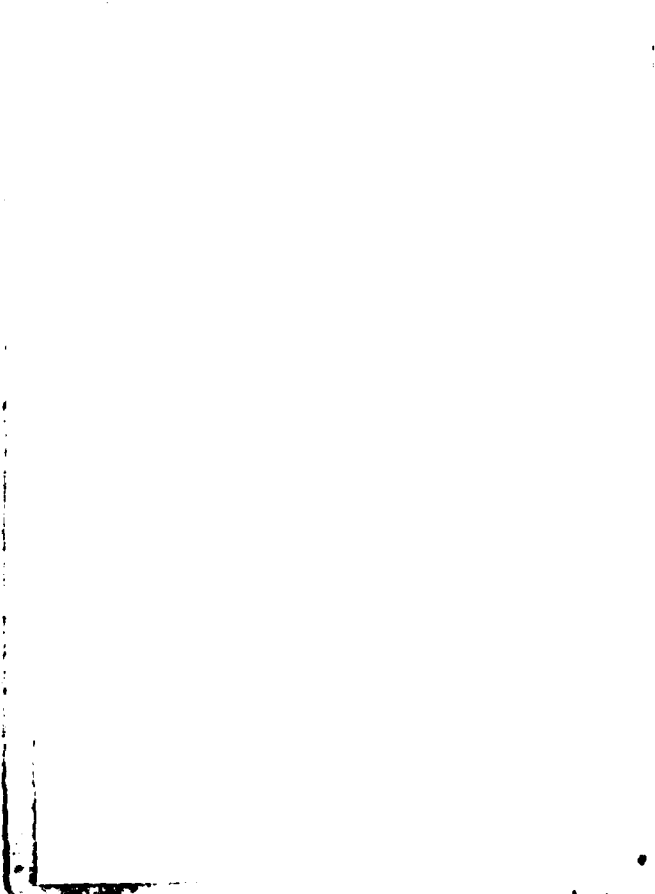
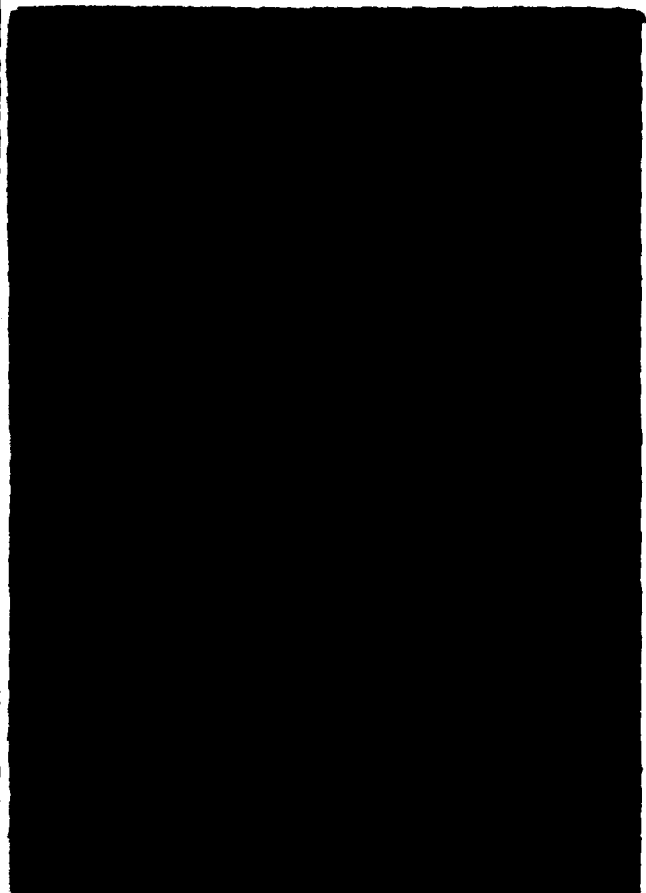
Back

- (5) View of the discharge line outlet at the toe of the downstream slope directly to the right of the spillway discharge wingwall.
- (6) Downstream exposure.

TOP OF PAGE

1,5	2,6
3	4





APPENDIX D
HYDROLOGY AND HYDRAULICS

APPENDIX D
HYDROLOGY AND HYDRAULICS

Methodology. The dam overtopping and breach analyses were accomplished using the systemized computer program HEC-1 (Dam Safety Investigation), September, 1978, prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. A brief description of the methodology used in the analysis is presented below.

1. **Precipitation.** The Probable Maximum Precipitation (PMP) is derived and determined from regional charts prepared from past rainfall records including "Hydrometeorological Report No. 40" prepared by the U.S. Weather Bureau.

The index rainfall is reduced from 10% to 20% depending on watershed size by utilization of what is termed the HOP Brook adjustment factor. Distribution of the total rainfall is made by the computer program using distribution methods developed by the Corps.

2. **Inflow Hydrograph.** The hydrologic analysis used in development of the overtopping potential is based on applying a hypothetical storm to a unit hydrograph to obtain the inflow hydrograph for reservoir routing.

The unit hydrograph is developed using the Snyder method. This method requires calculation of several key parameters. The following list gives these parameters their definition and how they were obtained for these analysis.

Parameter	Definition	Where Obtained
Ct	Coefficient representing variations of watershed	From Corps of Engineers*
L	Length of main stream channel miles	From U.S.G.S. 7.5 minute topographic
Lca	Length on main stream to centroid of watershed	From U.S.G.S. 7.5 minute topographic
Cp	Peaking coefficient	From Corps of Engineers*
A	Watershed size	From U.S.G.S. 7.5 minute topographic

*Developed by the Corps of Engineers on a regional basis for Pennsylvania.

3. Routing. Reservoir routing is accomplished by using Modified Plus routing techniques where the flood hydrograph is routed through reservoir storage. Hydraulic capacities of the outlet works, spillways and the crest of the dam are used as outlet controls in the routing.

The hydraulic capacity of the outlet works can either be calculated and input or sufficient dimensions input and the program will calculate an elevation discharge relationship.

Storage in the pool area is defined by an area - elevation relationship from which the computer calculates storage. Surface areas are either planimeted from available mapping or U.S.G.S. 7.5 minute series topographic maps or taken from reasonably accurate design data.

4. Dam Overtopping. Using given percentages of the PMF the computer program will calculate the percentage of the PMF which can be controlled by the reservoir and spillway without the dam overtopping.

5. Dam Breach and Downstream Routing. The computer program is equipped to determine the increase in downstream flooding due to failure of the dam caused by overtopping. This is accomplished by routing both the pre-failure peak flow and the peak flow through the breach (calculated by the computer with given input assumptions) at a given point in time and determining the water depth in the downstream channel. Channel cross-sections taken from U.S.G.S. 7.5 minute topographic maps were used in the downstream flood wave routing. Pre and post failure water depths are calculated at locations where cross-sections are input.

HYDROLOGY AND HYDRAULICS ANALYSIS DATA BASE

NAME OF DAM: Sugar Creek Dam

PROBABLE MAXIMUM PRECIPITATION (PMP) = 22.2 (0.97) = 21.53"

STATION	1	2	3
Station Description	Sugar Creek Dam		
Drainage Area (square miles)	1.1		
Cumulative Drainage Area (square miles)	1.1		
Adjustment of PMP for Drainage Area (%) ⁽¹⁾			
6 hours	117		
12 hours	127		
24 hours	136		
48 hours	142		
72 hours	145		
Snyder Hydrograph Parameters			
Zone ⁽²⁾	11		
C _p ⁽³⁾	0.62		
C _t ⁽³⁾	1.5		
L (miles) ⁽⁴⁾	2.61		
L _{ca} (miles) ⁽⁴⁾	0.76		
tp = C _t (LxL _{ca}) 0.3 hrs.	1.84		
Spillway Data			
Crest Length (ft)	40		
Freeboard (ft)	5.1		
Discharge Coefficient	3.6		
Exponent	1.5		

(1) Hydrometeorological Report 40 (Figure 1), U.S. Weather Bureau & U.S. Army Corps of Engineers, 1965.

(2) Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's coefficients (C_p and C_t).

(3) Snyder's Coefficients.

(4) L=Length of longest water course from outlet to basin divide.
L_{ca}=Length of water course from outlet to point opposite the centroid of drainage area.

**CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA**

DRAINAGE AREA CHARACTERISTICS: DA = 1.1 sq.mi

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1354.8 -23 ac-ft

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1359.9 - 147

ELEVATION MAXIMUM DESIGN POOL: 1359.8

ELEVATION TOP DAM: 1359.9

SPILLWAY CREST:

a. Elevation 1354.8
b. Type Modified ogee
c. Width 40 feet
d. Length 67 feet
e. Location Spillover Mid embankment
f. Number and Type of Gates None

OUTLET WORKS:

a. Type 12" CIP
b. Location Junction of right spillway wingwall & earthen section
c. Entrance inverts 1344.9
d. Exit inverts 1344.9
e. Emergency drawdown facilities 12" CIP with 12" gate valve

HYDROMETEOROLOGICAL GAUGES:

a. Type None
b. Location None
c. Records None

MAXIMUM NON-DAMAGING DISCHARGE: Unknown



L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS
EDENSBURG PENNSYLVANIA

NAME SUGAR CREEK DAM
NUMBER PA-72B

SHEET NO. 1 OF
BY OTM DATE 12/80 & 1/81

LOSS RATE AND BASE FLOW PARAMETERS

AS RECOMMENDED BY THE BALTIMORE DISTRICT
CORPS OF ENGINEERS.

STR TL = 1 INCH
CN STL = 0.05 IN/HR.
STR TQ = 1.5 CFS. /MI²
QRCSN = 0.05 (5% OF PEAK FLOW)
RTIOR = 2

ELEVATION - CAPACITY RELATIONSHIP

FROM PENN DER FILES, U.S.G.S. 7.5 MIN. QUAD.
& FIELD INSPECTION DATA.

SPILLWAY CREST ELEVATION = 1354.8'
SURFACE AREA = 7.0 AC.

AT ELEVATION 1360', AREA = 41.3 AC.

AT ELEVATION 1380', AREA = 73.5 AC.

FROM GIVEN DATA APPENDIX - E, PAGE E-2

ELEVATION (FT)	STORAGE (GAL.)	STORAGE (AC·FT)
1344.8	0	0
1345	28,555	0.09
1346	170,754	0.5
1347	323,823	1.0
1348	491,480	1.5
1350	978,283	3.0
1352	2,350,074	7.2
1354	5,587,335	17.1
1354.8	7,621,741	23.4
FROM U.S.G.S. DATA.		
1360	_____	149.0
1380	_____	1297.0



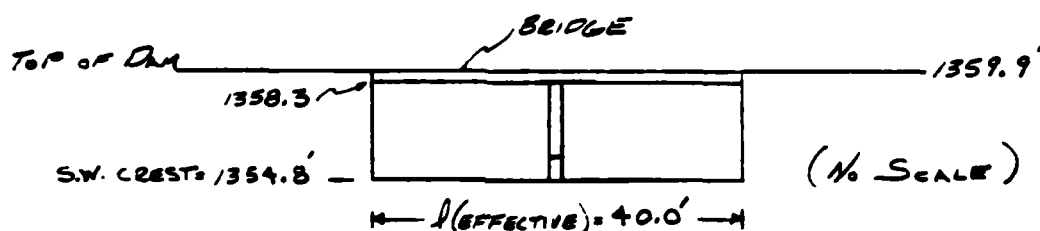
L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS
EDENSBURG PENNSYLVANIA

NAME SUGAR CREEK DAM
NUMBER PA-

SHEET NO. 2 OF
BY OTM DATE 1/81

\$S	0	0.5	1.0	3.0	17.1	28.4	149	1297
\$E	1344.8	1346	1347	1350	1354	1354.8	1360	1380

DISCHARGE RATING



FROM: $Q = C l h^{3/2}$

WHERE $C = 3.6$ (OGEE)
 $l = 40.0'$
 $h = \text{VARIES}$

"Q" TO BE DETERMINED BY HEC-1.

OVERTOPPING PARAMETERS

TOP OF DAM (LOW SPOT) = 1359.9'
LENGTH OF DAM (EXCLUDING SPILLWAY) = 210'
COEFFICIENT OF DISCHARGE (C) = 2.9 (BROAD CREST)

\$L	5	25	100	200	250	500	700
\$Y	1359.9	1360	1361	1362	1363	1365	1370

VALUES ESTIMATED FROM FIELD INSPECTION
DATA AND U.S.G.S. 7.5-MIN. QUAD.

 FLOOD HYDROGRAPH PACKAGE (HLC-1)
 DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 01 APR 80

1 ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF
 2 HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF SUGAR CREEK DAM (PA-728)

3 RATIOS OF PMF ROUTED THROUGH THE RESERVOIR

4	B	208	0	15	0	0	0	0	-4	0
5	B1	5								
6	J	1	2	1						
7	J1	.5	1							
8	K	0	1							
9	K1	INFLOW								
10	M	1	1.1							
11	P	21.53	117	127	136	147	145	1.0	0.05	
12	T									
13	W	1.84	0.62							
14	X	-1.05	-0.05	2.0						
15	K	1	2							
16	K1	RITE TMMU SUGAR CREEK DAM								
17	V			1						
18	V1	1								
19	VS	0	.5	1	3	7.2	17	23.4	149	1247
20	SE1344.8	1346	1347	1350	1352	1354	1354.8	1360	1360	1360
21	SE1354.8	.60	3.6	1.5						
22	SD1359.9	2.9	1.5	5						
23	SL	5	25	100	200	250	500	700		
24	SV1359.9	1360	1361	1362	1363	1365	1370			
25	K	99								

FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 01 APR 80

RUN DATE= 01/01/72.
TIME= 07.50.49.

ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF
HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF SUGAR CREEK DAM (PA-728)
RATIOS OF PMF ROUTED THROUGH THE RESERVOIR

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
288	0	15	0	0	0	0	0	-4	0
JOPER= 5									
NRT= 0									
LROPT= 0									
TRACE= 0									

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRATIO= 2 LRTIO= 1

RTIOSS= .50 1.00

SUB-AREA RUNOFF COMPUTATION

INFLOW

ISTAO	ICUMP	ILCON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

HYDQ	IUNG	TAHCA	SHAP	INSUA	INSPC	RATIO	ISHOW	ISAME	LOCAL
1	1	1.10	0.00	1.10	1.00	0.000	0	0	0

PRECIP DATA

SPEE	PRS	R6	R12	R24	R48	R72	R96
0.00	21.55	117.00	127.00	136.00	142.00	145.00	0.00

LOSS DATA

LIMPT	STHR	DLTK	RTIOL	ERAIN	SINKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 1.84 CP= .62 NTA= 0

SYKTO= -1.30 RECUSSION DATA
 QRCSD= -.05 RTTOR= 2.00

UNIT HYDROGRAPH 41 END-OF-PERIOD ORDINATES, LAG= 1.84 MINUS, CP= .62 VOL= 1.00

11.	41.	83.	129.	176.	214.	237.	264.	290.	207.
174.	150.	130.	112.	97.	83.	72.	62.	53.	46.
40.	34.	30.	26.	22.	19.	16.	14.	12.	11.
9.	8.	7.	6.	5.	4.	4.	3.	3.	2.

	SUM	31.22	28.49	2.73	82104.
	(793.11	724.11	69.11	2324.931	

HYDROGRAPH ROUTING

ROUTE THRU SUGAR CREEK DAM

ISTAU	ICOMP	IECON	ITAPE	JPLT	JPRI	INAME	ISTAGE	IAUJO
2	1	0	0	0	0	0	0	0

CLASS	CLASS	AVG	ROUTING DATA			IPMP	LSTR
			INES	ISAME	IOPT		
0.0	0.000	0.00			0	0	0

INSTPS	NSTDL	LAG	AMSKK	X	ISK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1935.	0

CAPACITY=	00	10	10	30	70	170	230	1490	12970
ELEVATION=	13450	13460	13470	13500	13520	13540	13550	13600	13800

CNEL	SPWTD	COOW	EXPH	ELEV	COOL	CAREA	EXPL
1354.8	40.0	3.6	1.2	0.0	0.0	0.0	0.0

DAM DATA		
TOPEL	COOD	EXPD
1359.9	2.9	1.5
		DAMWID
		5.0

CREST LENGTH AT OR BELOW ELEVATION	5.	25.	100.	200.	250.	500.	700.
1359.9	1360.0	1361.0	1362.0	1363.0	1365.0	1370.0	

PEAK OUTFLOW IS 1710. AT TIME 42.00 HOURS

PEAK OUTFLOW IS 3419. AT TIME 42.00 HOURS

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

RATIOS APPLIED TO FLOWS

OPERATION	STATION	AREA	PLAN	RATIO	1	RATIO	2
					.50		1.00

HYDROGRAPH AT	1	1.10	1	1846.	3693.
	(2.89)	(52.28)	104.57)
ROUTED TO	2	1.10	1	1710.	3419.
	(2.89)	(48.41)	96.82)

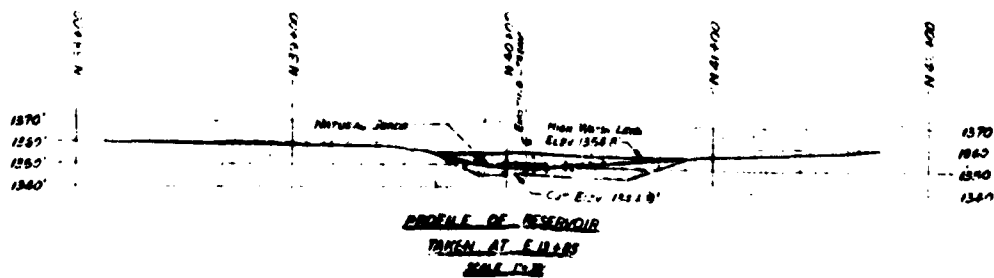
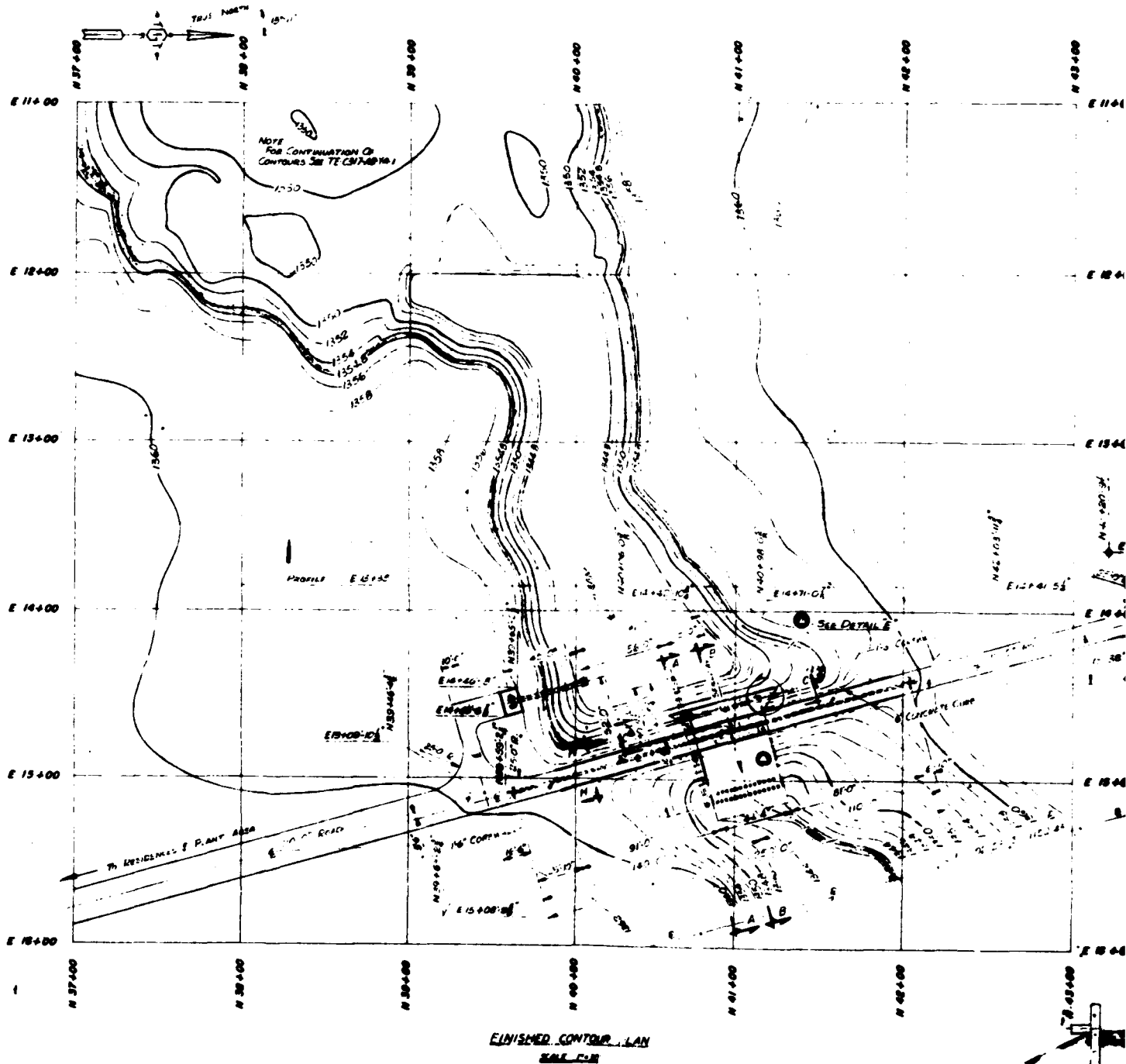
SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1									
ELEVATION		INITIAL VALUE		SPILLWAY CRUISE		TOP OF DAM			
STORAGE		1354.80		1354.80		1459.90			
OUTFLOW		23%		23%		147%			
		0%		0%		165%			
RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF		TIME OF	
						MAX		FAILURE	
.50 1.00	1960.00	.10	149.	1710.	1.00	42.00		0.00	
	1361.91	2.01	259.	3419.	5.00	42.00		0.00	

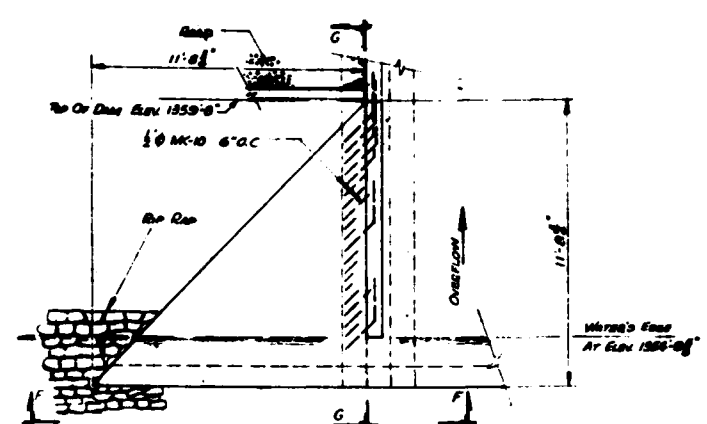
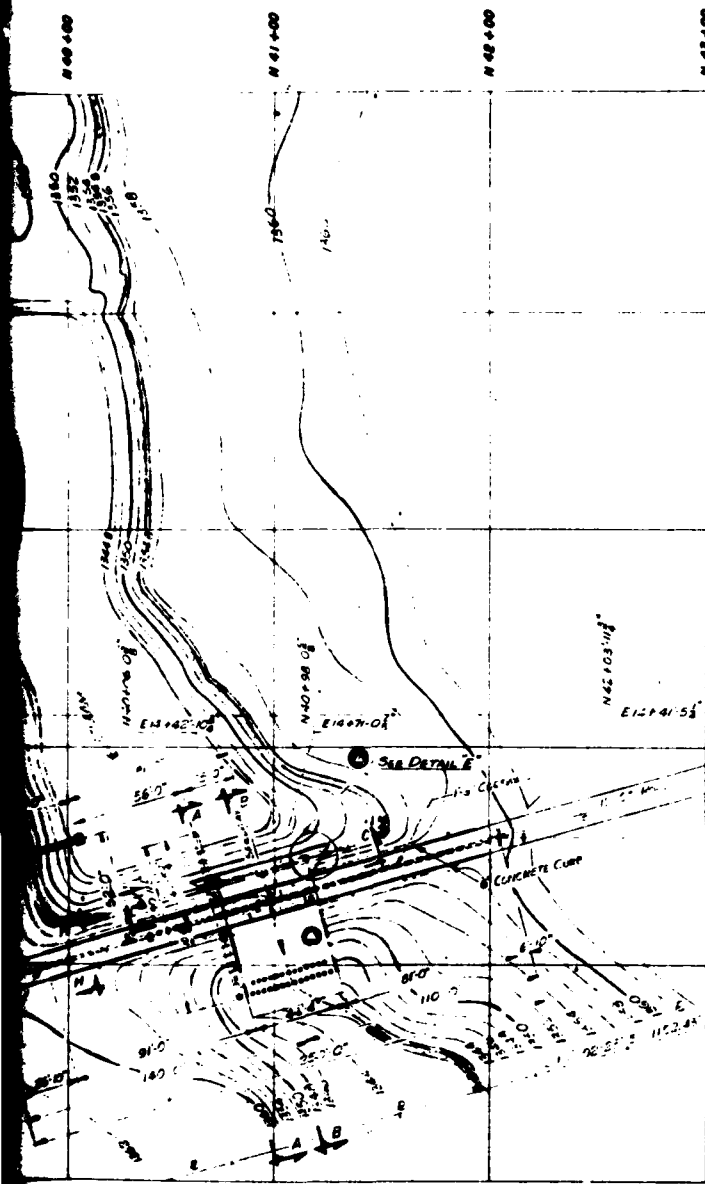
APPENDIX E
DRAWINGS

75.2
PE

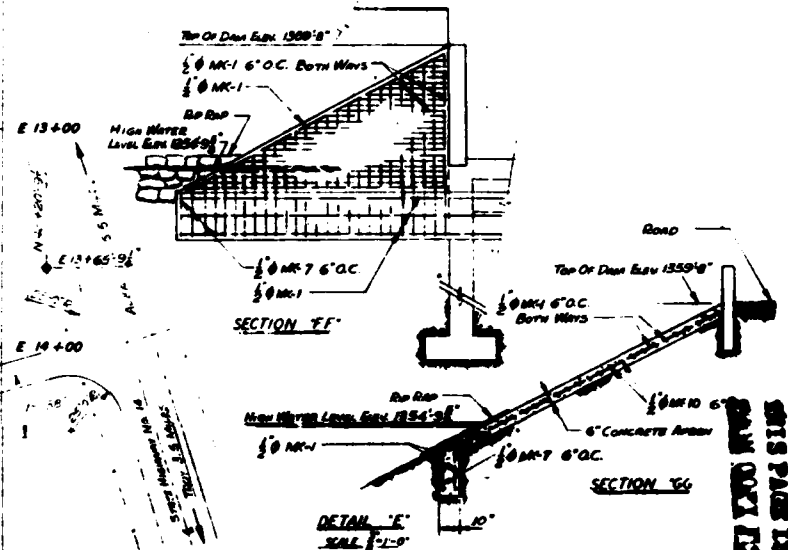




NOTE
 ABOUT OF B
 1000 G
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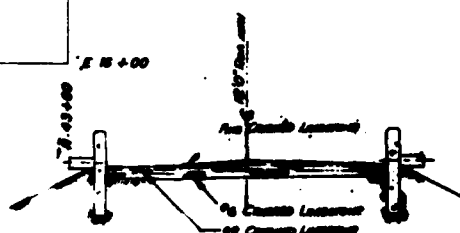
● PARTIAL PLAN - SPILLWAY APRON - L.H. SHOWN, R.H. OPPOSITE



● WATER IMPOUNDED

ELEVATION	AMOUNT IN GALLONS
* 1354.8 (Elev. Dam)	7 682 741
1354.0	5 387 880
1353.0	3 682 090
1352.0	2 380 076
1351.0	1 387 265
1350.0	978 285
1349.0	684 078
1348.0	484 480
1347.0	329 885
1346.0	170 784
1345.0	85 585
1344.8 (Bottom)	0

* Pond Area At This Elevation 370 000 Sq. Ft.

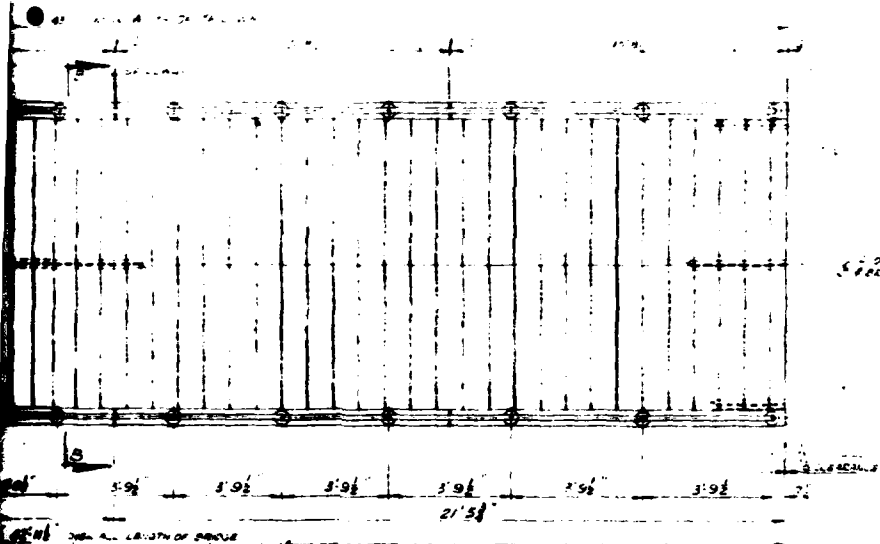


NOTES: Damaged to be thoroughly worked down during the implosion.

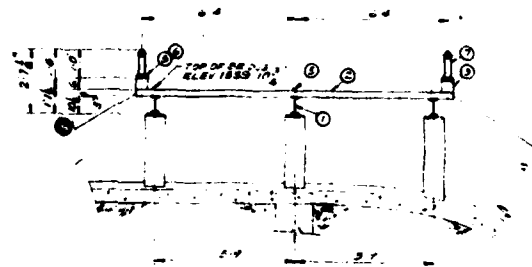
SECTION 'ABC' at Scale

NOTE
 Amount Of Earth Excavated From Laboratory
 6000 Cubic Yards
 Amount Of Earth Required For Dam
 8800 Cubic Yards
 Excess
 1800 Cubic Yards

TE-CITAB-11-1	Project Name: New Reservoir Area
TE-CITAB-11-2	Project No.: 11-1
TE-CITAB-11-3	Project Date: 11-1
TE-CITAB-11-4	Project Location: 11-1
TE-CITAB-11-5	Project Status: 11-1
TE-CITAB-11-6	Project Description: 11-1
TE-CITAB-11-7	Project Notes: 11-1
TE-CITAB-11-8	Project Drawings: 11-1
TE-CITAB-11-9	Project Specifications: 11-1
TE-CITAB-11-10	Project Materials: 11-1
TE-CITAB-11-11	Project Labor: 11-1
TE-CITAB-11-12	Project Equipment: 11-1
TE-CITAB-11-13	Project Safety: 11-1
TE-CITAB-11-14	Project Quality: 11-1
TE-CITAB-11-15	Project Cost: 11-1
TE-CITAB-11-16	Project Schedule: 11-1
TE-CITAB-11-17	Project Risk: 11-1
TE-CITAB-11-18	Project Impact: 11-1
TE-CITAB-11-19	Project Legacy: 11-1
TE-CITAB-11-20	Project Future: 11-1



PLAN
SCALE - NONE

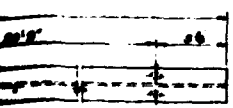


SECTION B-B
SCALE - NONE

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FROM COPY FURNISHED TO BUREAU

NO.	DESCRIPTION	QUANTITY
1	1" X 4" X 8" LUMBER	100
2	2" X 4" X 8" LUMBER	100
3	3" X 4" X 8" LUMBER	100
4	4" X 4" X 8" LUMBER	100
5	5" X 4" X 8" LUMBER	100
6	6" X 4" X 8" LUMBER	100
7	7" X 4" X 8" LUMBER	100
8	8" X 4" X 8" LUMBER	100
9	9" X 4" X 8" LUMBER	100
10	10" X 4" X 8" LUMBER	100
11	11" X 4" X 8" LUMBER	100
12	12" X 4" X 8" LUMBER	100
13	13" X 4" X 8" LUMBER	100
14	14" X 4" X 8" LUMBER	100
15	15" X 4" X 8" LUMBER	100
16	16" X 4" X 8" LUMBER	100
17	17" X 4" X 8" LUMBER	100
18	18" X 4" X 8" LUMBER	100
19	19" X 4" X 8" LUMBER	100
20	20" X 4" X 8" LUMBER	100
21	21" X 4" X 8" LUMBER	100
22	22" X 4" X 8" LUMBER	100
23	23" X 4" X 8" LUMBER	100
24	24" X 4" X 8" LUMBER	100
25	25" X 4" X 8" LUMBER	100
26	26" X 4" X 8" LUMBER	100
27	27" X 4" X 8" LUMBER	100
28	28" X 4" X 8" LUMBER	100
29	29" X 4" X 8" LUMBER	100
30	30" X 4" X 8" LUMBER	100
31	31" X 4" X 8" LUMBER	100
32	32" X 4" X 8" LUMBER	100
33	33" X 4" X 8" LUMBER	100
34	34" X 4" X 8" LUMBER	100
35	35" X 4" X 8" LUMBER	100
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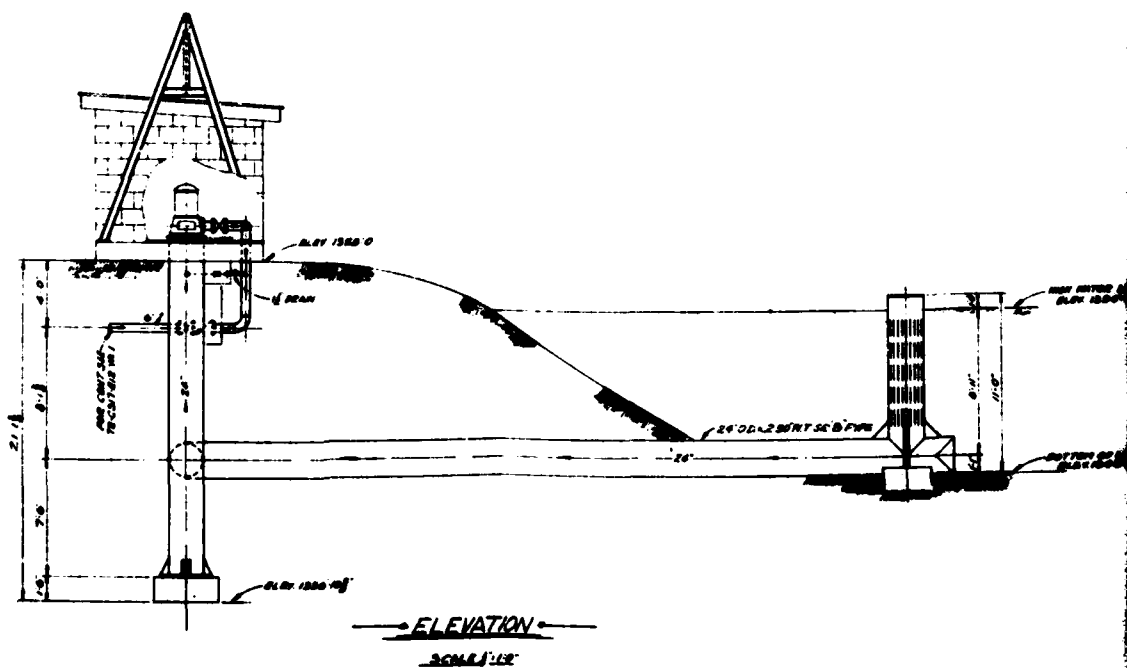
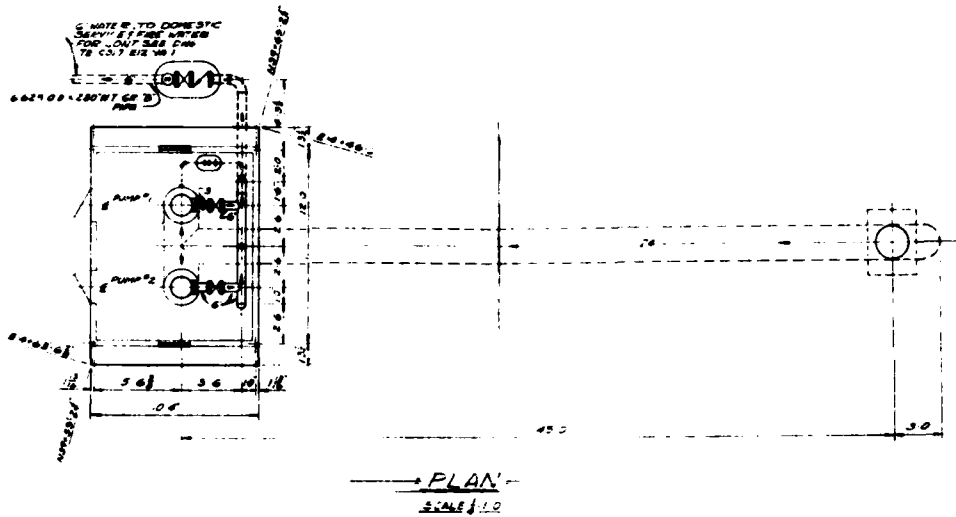
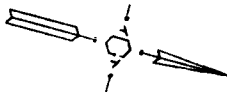
NOTE
MATERIAL FURNISHED BY CONTRACTOR EXCEPT THAT
STEEL BOLTS WHICH WILL BE FURNISHED BY T.G.T.



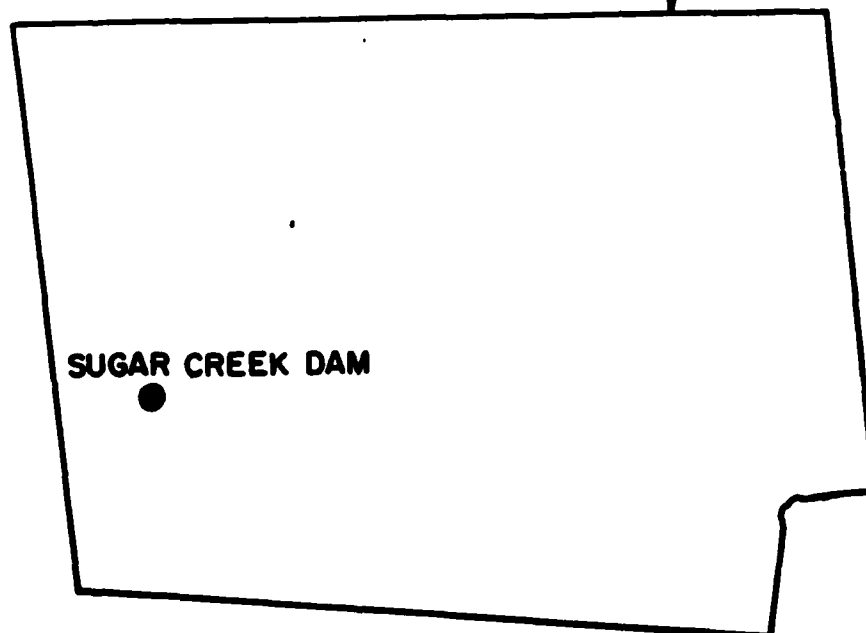
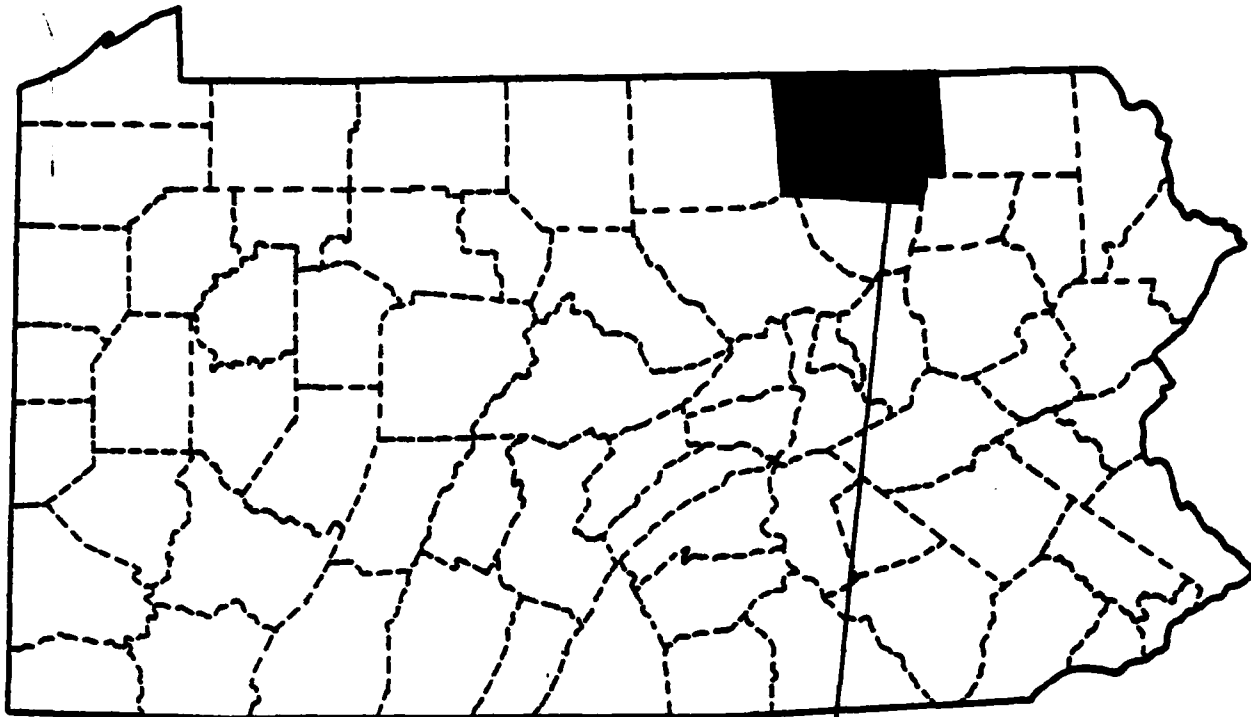
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NOTE
DRILL 1\"/>

TE-C37-A8-VA-4		Revised Current Plan See Other Area	
DRAWING NO.		TITLE	
REFERENCE DRAWINGS			
TENNESSEE GAS TRANSMISSION CO.			
ENGINEERING DEPARTMENT		REVISIONS	
BRIDGE PLAN & DETAILS DAM AND RESERVOIR AREA STATION NO 37 1955 CONSTRUCTION BRADFORD COUNTY, PENNSYLVANIA			
DESIGNED BY		CHECKED BY	
DRAWN BY		APPROVED BY	
DATE		DATE	
CONSTRUCTION DEPARTMENT		CONSTRUCTION DEPARTMENT	
TE-C37-A8-VA-4		TE-C37-A8-VA-4	



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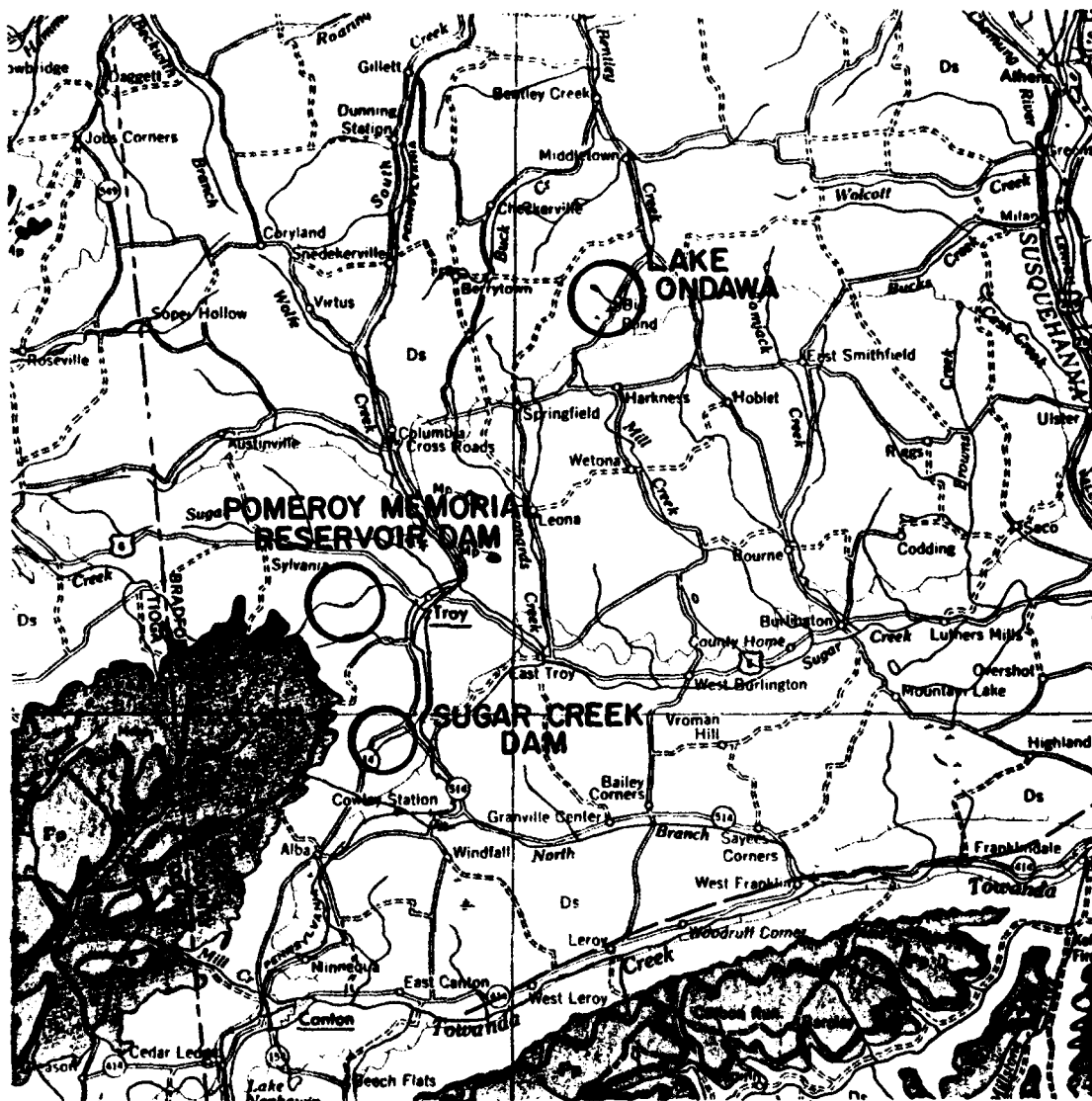
**SITE LOCATION MAP
BRADFORD COUNTY, PENNSYLVANIA**

APPENDIX F
GEOLOGY

General Geology

The Sugar Creek Dam is located in the (Glaciated) Low Plateaus of the Appalachian Plateaus Province. The topography is greatly dissected leaving only remnants of the plateau surface. The area lies within the region of land once covered by the most recent ice sheet, the Wisconsin ice sheet. The advancing and retreating of the ice affected the topography and left behind glacial drift or outwash. The sand and gravel of the glacial drift are the largest producers of groundwater in the area.

The bedrock outcropping in this area consists of sandstones, shales, and graywackes of the Susquehanna Group of Upper Devonian Age. This group contains the following formations, from youngest to oldest: Oswayo Formation, Catskill Formation, and marine beds including both the "Chemung" and "Portage" beds. The Sugar Creek Dam is situated on the Catskill side of the Catskill/Chemung contact. These strata strike to the northeast, having a dip direction to the northwest. This structural natural is due to the Blossburg Synclinal axis to the northwest of the dam. There is no known faulting in the area.



GEOLOGIC MAP OF AREA AROUND POMEROY MEMORIAL RESERVOIR DAM, SUGAR CREEK DAM AND LAKE ONDAWA DAM

SCALE 1:250,000

DEVONIAN
UPPER
CENTRAL AND EASTERN PENNSYLVANIA



Oswayo Formation

Brownish and greenish gray, fine and medium grained sandstones with some shales and scattered calcareous lenses; includes red shales which become more numerous eastward. Relation to type Oswayo not proved.



Catskill Formation

Chiefly red to brownish shales and sandstones, includes gray and greenish sandstone tongues named Elk Mountain, Honesdale, Shohola, and Delaware River in the east.



Marine beds

Gray to olive brown shales, graywackes, and sandstones; contains "Chernung" beds and "Pottsville" beds including Hurket, Brallier, Harrell, and Trimmers Rock; Tully Limestone at base.



Susquehanna Group

Barbed line in "Chernung-Catskill" contact of Second Pennsylvania Survey County reports; barbs on "Chernung" side of line.